

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Sengupta, et al

Art Unit: 1797

Serial No. 10/812,450

Examiner: Menon, Krishnan S.

Filed: March 30, 2004

For: THREE PORT HIGH PERFORMANCE MINI
HOLLOW FIBER MEMBRANE CONTACTOR

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REPLY BRIEF 37 CFR § 41.41

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Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Reply Brief is being filed within two month from the mailing date of the Examiner's Answer, which was mailed on May 12, 2008.

CERTIFICATE OF EFS TRANSMISSION

I hereby certify that this correspondence is being filed electronically with the United States Patent and Trademark Office on July 10, 2008.

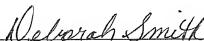

Deborah Smith

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I. STATUS OF THE CLAIMS

Claims 1-14 were originally filed in this case. Claims 2 and 9 have been cancelled. Claims 1, 3, 7, 8, 10 and 14 have been amended. Claims 15-22 have been added. Added claims 19-22 have been amended.

Claims 1, 3-8 and 10-22 stand rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,616,841 ("Cho") in view of US Patent No. 4,623,460 ("Kuzumoto") or alternatively over Kuzumoto in view of Cho. Claims 1, 3-8 and 10-22 also stand rejected under 35 U.S.C. 103(a) as being obvious over US Patent Publication No. 2003/0154856 ("Anderson") in view of Cho, or in the alternative Cho in view of Anderson.

Accordingly, claims 1, 3-8 and 10-22 are the subject of this Appeal.

II. GROUND'S OF REJECTION TO BE REVIEWED ON APPEAL

A. 35 U.S.C. §103(a) over Kuzumoto and Cho

Claims 1, 3-8 and 10-22 stand rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,616,841 ("Cho") in view of US Patent No. 4,623,460 ("Kuzumoto") or alternatively, Kuzumoto in view of Cho.

B. 35 U.S.C. §103(a) over Anderson and Cho

Claims 1, 3-8 and 10-22 also stand rejected under 35 U.S.C. 103(a) as being obvious over US Patent Publication No. 2003/0154856 ("Anderson") in view of Cho or alternatively, Cho in view of Anderson.

Independent claims 19, 20, 21 and 22 stand or fall together under 35 U.S.C. § 103(a).

Independent claims 1, 7, 8 and 14 stand or fall together under 35 U.S.C. § 103(a) but should be ruled upon separately from independent claims 19, 20, 21 and 22 as they include an additional element.

Claims 3-6 depend from claim 1; thus, the allowance of claims 3-6 depend from the allowance of claim 1. As a result, claims 1 and 3-6 stand or fall together.

Claims 10-13 depend from claim 8; thus, the allowance of claims 10-13 depend from the allowance of claim 8. As a result, claims 8 and 10-13 stand or fall together.

III. ARGUMENT

Applicants note that in the Examiner's Answer, the Examiner has acknowledged that: the (3) STATUS OF THE CLAIMS, (4) STATUS OF AMENDMENTS AFTER FINAL, (5) SUMMARY OF THE CLAIMED SUBJECT MATTER, (6) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL, (7) CLAIMS APPENDIX, are all correct. Further it is noted that Applicants provided a statement identifying the (1) REAL PARTY IN INTEREST, and the (2) RELATED APPEALS AND INTERFERENCES.

Applicants note that there is no controversy on what the stated grounds of rejection are, the only issue in controversy is whether the Examiner's rejections of Claims 1, 3-8 and 10-22 under 35 U.S.C. 103(a) as being obvious over Cho and Kuzumoto, or the Examiner's rejections of Claims 1, 3-8 and 10-22 under 35 U.S.C. 103(a) as being obvious over Anderson and Cho, are correct.

The multiple inaccurate or misleading statements in the Examiner's Answer compel the Applicant to file this reply brief.

THE INVENTION

The invention, as discussed in the Applicant's Appeal Brief, is directed to a three-port high performance mini hollow fiber membrane contactor. The three-port hollow fiber membrane contactor is a simple configuration of a membrane contactor that is easily

manufactured. The instant configuration includes a cartridge, a shell, a first end cap, and a second end cap. The shell encloses the cartridge and has an opening. The cartridge includes a perforated center tube, a hollow fiber fabric, a first tube sheet, a second tube sheet, and a plug. The perforated center tube has a first end and a second end, and the hollow fiber fabric surrounds the center tube. A first tube sheet and a second tube sheet affix the hollow fiber fabric to the center tube at each end of the center tube, and the plug is located at the first tube sheet. The hollow fiber membranes are open at the first tube sheet and the hollow fiber membranes are closed at the second tube sheet. The first end cap and the first tube sheet define a first headspace therebetween. The first end cap has an opening therethrough, which is in communication with the hollow fiber lumens via the first headspace. The second end cap and the second tube sheet define a second headspace therebetween. The second end cap has an opening which is in communication with the center tube via the second headspace.

This configuration of a hollow fiber membrane is non-obvious under 35 U.S.C. § 103 because none of the prior art references (Kuzumoto, Cho and Anderson) teach, suggest or provide a "reason"¹

¹ In the most recent Supreme Court ruling on obviousness, *KSR. v. Teleflex*, the court addressed the teaching, suggestion, motivation standard issue by stating

for providing a membrane contactor with the above described configuration.

The lack of a teaching, suggestion or "reason" is embodied by the fact that none of the prior art references teach or suggest providing a configuration of a membrane contactor that allows for both of the end caps to be sealed or attached to the membrane contactor at a single location, which the instant configuration allows for. This advantage is the basis of the Applicant's argument for patentability. The Examiner has failed to properly show a teaching, suggestion or "reason" of this advantage in the prior art.

The instant configuration of a membrane contactor has end caps that are each sealed to the membrane contactor at a single location, the end of the shell, making the contactor more easy to manufacture (see Sengupta Declaration, Exhibit 1). See Annotated Figure 1 below.

it is important to find a "reason" for combining the prior art. *KSR International Co. v. Teleflex Inc.*, 550 US _____, at 15(2007).

The First End Cap is attached to the shell at a single location - the end of the shell.

The Second End Cap is attached to the shell at a single location - the end of the shell.

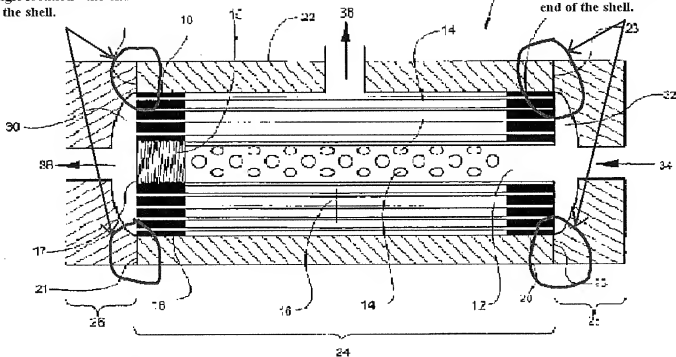


Fig. 1

As shown above, both of the end caps of the instant invention are sealed or attached at a single location, the shell ends.

Previous configurations of membrane contactors, including Kuzumoto, Cho, and Anderson, require at least one of the end caps to be attached to the membrane contactor at two or more locations, i.e., the shell wall/end and the center tube. Attaching an end cap at two or more locations requires the end cap to be simultaneously dual welded to the membrane contactor. This dual welding step is a very difficult manufacturing step. See Exhibit 1, Declaration of Amitava Sengupta. Thus, the instant configuration of a membrane contactor allows the membrane contactor to be produced more easily

by eliminating the need to dual weld either of the end caps to the membrane contactor.

This aspect of the instant invention of eliminating the need to dual weld either of the end caps to the membrane contactor is allowed by the entire² configuration of the membrane contactor, as claimed. However, for purposes of this appeal, the applicant has focused on one specific aspect of this configuration of a membrane contactor which permits the membrane contactor to be made without dual welding either end cap. Namely, the applicant focused on the second headspace defined by the second end cap and the second tube sheet³. This second headspace, which is associated with the closed ends of the hollow fibers, forces the opening in the second end cap to communicate with the center tube via the second headspace (see Figure 1).

Nowhere in the prior art is there a teaching, suggestion or reason for providing a second headspace that forces the opening in an end cap to communicate with the center tube via a headspace. All end caps in the prior art teach the opening in the end cap that needs to communicate with the center tube to communicate directly

² Although the applicant is focusing on the second headspace for purposes of this appeal, as Noted by the Examiner, the entire configuration of the membrane contactor is the invention as claimed.

³ The first end cap does not communicate with the center tube, thus, the first end cap also does not have to be sealed at two locations (i.e., the center tube and the shell ends).

with the center tube. The Examiner has clearly missed the mark by not addressing this argument.

This aspect of the prior art, including Cho, Kuzumoto and Anderson, where the end cap communicates directly with the center tube, requires the end cap to be sealed or connected to the center tube, forcing the end cap to be sealed at two locations, i.e., the shell end/wall and the center tube. Thus, the instant configuration of a membrane contactor with a second headspace that forces the end cap to communicate with the center tube via the headspace is what allows the second end cap to be attached to the membrane contactor at a single location.

Although the applicant is focusing on the second headspace for purposes of this appeal, the entire configuration of the membrane contactor is the invention as claimed. The configuration as claimed (i.e. the configuration of the shell, tube sheets, end caps, headspaces, hollow fiber membranes, etc.) are what allows for the membrane contactor to be functional while having a second headspace that forces the opening through the second end cap to communicate with the center tube via the headspace. For instance, in order to provide a second headspace as claimed, the center tube must be open at the same end where the hollow fiber lumens are closed. None of the prior art references show a configuration of a

membrane contactor that would be functional with a second headspace that forces the opening through the second end cap to communicate with the center tube via the headspace because none of the prior art references show a headspace where the center tube is open at the same end where the hollow fiber lumens are closed. Thus, none of the prior art references allows the end caps to be sealed or attached to the membrane contactor at a single location.

In sum, the instant configuration of a membrane contactor with a second headspace for forcing the opening in the second end cap to communicate with the center tube via the second headspace is non-obvious because there is no teaching, suggestion, or "reason" for providing the second headspace. The second headspace allows the membrane contactor to be made more easily by eliminating the need to dual weld either of the end caps to the membrane contactor. All of the prior art, including Cho, Kuzumoto and Anderson require at least one end cap to be simultaneously dual welded. The instant invention eliminates the need to simultaneously dual weld either of the end caps, which clearly is an advantage of the instant invention over the prior art.

In the Examiner's answer, the Examiner set forth multiple inaccurate or misleading statements that compel the Applicant to file this reply brief. The Examiner's inaccurate statements are

outlined below with regard to the two obviousness rejections, Cho with Kuzumoto, and Anderson with Cho.

i) APPLICANT'S ARGUMENT THAT THE INSTANT INVENTION ELIMINATES A DUAL WELDING STEP IS COMMENSURATE IN SCOPE WITH THE CLAIMS AND IS A CRITICAL ELEMENT

In the Examiner's Answer on page 16, lines 12-16, page 18, lines 6-11, and page 23, lines 15-21, the Examiner submits that the Applicant's argument that the instant invention eliminates a dual welding step required by the prior art is not commensurate in scope with the claims. The Examiner further submits on page 17, lines 8-14, and page 19, lines 8-11, that the second end cap and second head space of the instant invention are not critical and do not serve any purpose. The Examiner is clearly mistaken as discussed below.

None of the prior art references, Cho, Kuzumoto, nor Anderson, alone or in combination, teach, suggest or provide a "reason" for making a membrane contactor with all of the claim elements from independent claims 1, 7, 8, 14 and 19-22. More specifically, none of the prior art references, alone or in combination, teach, suggest or provide a "reason" for making the claim element from independent claims 1, 7, 8, 14 and 19-22 of "said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining

a second head space therebetween; said second end cap opening being in communication with said center tube via said second head space."

Accordingly, this element from independent claims 1, 7, 8, 14 and 19-22, is nonobvious because it allows the membrane contactor to be made without having to simultaneously dual weld the end caps to the shell, as discussed in the Sengupta Declaration (see Exhibit 1). Providing the second headspace (defined by the second tube sheet and the second end cap) that forces the end cap to communicate with the center tube via the headspace (not directly with the center tube as required by all the prior art references), eliminates the need to weld the end cap to the center tube in the instant invention. Thus, contrary to the Examiner's assertion, the second end cap and second headspace are clearly critical to the instant invention. This is further illustrated by the two examples below.

Example 1 below, is the instant invention, where the end cap communicates with the center tube via the second headspace. This allows the end cap to be connected to the membrane contactor at a single weld locations, the end of the housing shell.

The First End Cap is attached to the shell at a single location - the end of the shell.

The Second End Cap is attached to the shell at a single location - the end of the shell.

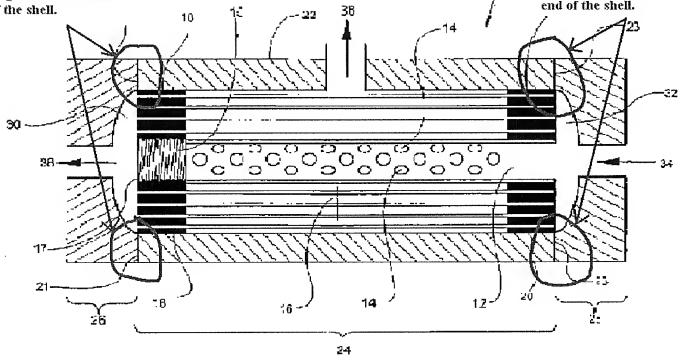
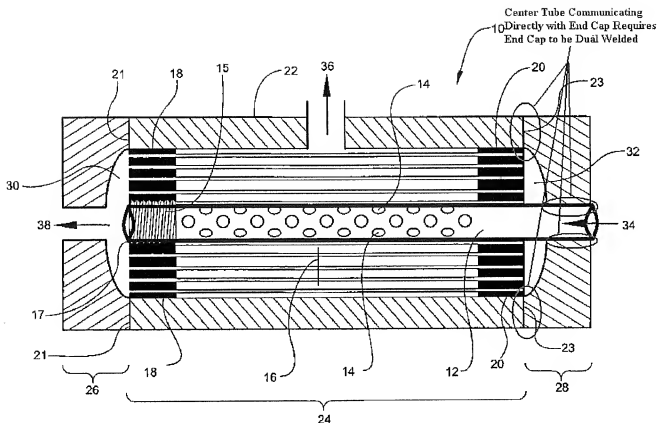


Fig. 1

Example 2 below, is the instant invention modified where the end cap communicates directly with the center tube (the center tube has been extended to communicate directly with the end cap). This requires the second end cap to be simultaneously dual welded to the center tube and the housing shell, as discussed in the Sengupta Declaration (see Exhibit 1).



As shown above, when the center tube communicates directly with the end cap (not via the second headspace), the end cap has to be dual welded. This is confirmed by review of the prior art references; see annotated Figure 4 of Cho (page 21 of appeal brief); annotated Figure 1 of Kuzumoto (page 26 of Appeal Brief); and annotated Figure 3 of Anderson (page 36 of Appeal Brief).

It is unambiguous that providing a second head space that forces the end cap to communicate with the center tube via the headspace and not directly with the center tube, as claimed in independent claims 1, 7, 8, 14 and 19-22, allows the membrane contactor to be made more easily by eliminating the need to

simultaneously dual weld the end caps. Thus, the Applicant has clearly shown that the second end cap and second headspace are critical elements to the instant invention.

In addition, as shown above, the second end cap and the second headspace, as defined in independent claims 1, 7, 8, 14 and 19-22, allow the membrane contactor to be made without the need to dual weld the end cap. Accordingly, the Examiner's assertion that the Applicant's argument was not commensurate in scope with the claims is clearly wrong and unsupported.

- ii) THE INSTANT INVENTION IS NOT A SUBSTITUTION OF AN EQUIVALENT COMPONENT, A MERE REVERSAL OF PARTS, OR A REARRANGEMENT OF PARTS AS THE EXAMINER HAS ASSERTED

In the Examiner's Answer on page 4, lines 14-19 and page 5, lines 11-14, page 20, lines 13-19, page 22, lines 4-9 and page 23, line 13-15, the Examiner submits that the instant invention is just a mere substitution of equivalent parts, a mere reversal of parts, or a mere rearrangements of parts. As shown below, the Examiner is again clearly mistaken.

As discussed above, independent claims 1, 7, 8, 14 and 19-22, include the element of "said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween; said second

end cap opening being in communication with said center tube via said second head space." No where in the prior art is there a teaching of this element, as the Examiner has acknowledged by his obviousness rejections.

The Examiner asserts that this element is obvious because it is a mere substitution of equivalent parts from the prior art. However, the Examiner has not addressed the fact that the instant invention, by providing the above element, eliminates the need to simultaneously dual weld the end cap to the center tube and the housing shell. The fact of the matter is, nowhere in the prior art is there a teaching of this element. Thus, this element from independent claims 1, 7, 8, 14 and 19-22 is clearly not an equivalent element from the prior art as the Examiner has asserted because, as shown above, the element clearly provides an advantage over the teachings of the prior art.

The second assertion that the Examiner makes is that the above element from independent claims 1, 7, 8, 14 and 19-22 is just a mere reversal of parts from the prior art. However, the Examiner has failed to bring forward any teaching from the prior art of a second head space where the second end cap communicates with the center tube via the second headspace, or its opposite. Thus, how can this element be a mere reversal of parts from the prior art

when the element, or its opposite, does not exist in the prior art. Again, the Examiner is clearly mistaken.

The final assertion that the Examiner makes is that the above element from independent claims 1, 7, 8, 14 and 19-22 is just a rearrangement of parts from the prior art. Again, the Examiner has failed to show any teaching from the prior art of a second head space where the end cap communicates with the center tube via the second headspace. Thus, how can this element be a mere rearrangement of parts from the prior art when the element does not exist in the prior art. Again, the Examiner is clearly mistaken.

In sum, the Examiner's assertions that the element from independent claims 1, 7, 8, 14 and 19-22 of "said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween; said second end cap opening being in communication with said center tube **via said second head space**" is an equivalent substitution, a mere reversal of parts, or a rearrangement of parts, is clearly unsupported and wrong.

- ii) EXTENDING THE CENTER TUBE OF CHO TO COMMUNICATE DIRECTLY WITH THE END CAP DOES NOT PROVIDE A SECOND HEAD SPACE AS DEFINED IN THE INSTANT INVENTION

In the Examiner's Answer on page 10, lines 1-7, the Examiner submits that extending the center tube in the Cho reference; namely Figure 4, to communicate directly with the end cap provides a second head space as defined in the instant invention, as a result, the instant invention is obvious. As shown below, the Examiner is once again clearly mistaken.

First, there is no teaching, suggestion or reason for making the Examiner's suggested modification of Cho. The Examiner is clearly using impermissible hindsight reconstruction to arrive at the instant invention.

Second, even if one were to extend the center tube in Figure 4 of Cho to communicate directly with the end cap, this does not provide a second headspace as claimed in independent claims 1, 7, 8, 14 and 19-22. The second headspace is defined in independent claims 1, 7, 8, 14 and 19-22 as "said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween." Accordingly, the second headspace of the instant invention is defined by the second tube sheet and the second end cap. Clearly,

the second headspace is not defined by a center tube running, as the Examiner has suggested with his modification of Cho.

In addition, redesigning Cho where the center tube connects directly with the end cap, as the Examiner has suggested, contradicts the elements in the claims of "said second end cap opening being in communication with said center tube **via said second head space.**" Clearly having the center tube connect directly with the end cap eliminates the end cap opening being in communication with the center tube **"via the second head space."** All words in a claim must be considered in judging the obviousness of a claim. See MPEP § 2141.

Therefore, the Examiner's suggested modification of Cho to extend the center tube in Figure 4 to communicate directly with the end cap is clearly wrong and unsupported. Thus, the Examiner's proposed modification of the Cho reference does not obviate the instant invention.

iii) KUZUMOTO DOES NOT TEACH A SECOND HEADSPACE AS DEFINED IN THE INSTANT INVENTION

In the Examiner's Answer on page 11, line 1 through page 12, line 4, the Examiner submits that the Kuzumoto reference (namely Figure 1) teaches a second headspace as claimed in the instant

invention. As shown below, the Examiner is once again clearly mistaken.

As discussed above, the second headspace is defined in independent claims 1, 7, 8, 14 and 19-22 as "said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween." Accordingly, the second headspace of the instant invention is defined by the second tube sheet and the second end cap. Clearly, the second headspace is not defined by a center tube running through it, as in Figure 1 of Kuzumoto. In addition, having the center tube connect directly with the end cap, as in Figure 1 of Kuzumoto, contradicts the elements in the independent claims of "said second end cap opening being in communication with said center tube via said second head space." Clearly having the center tube connect directly with the end cap eliminates the end cap opening being in communication with the center tube "via the second head space." All words in a claim must be considered in judging the obviousness of a claim. See MPEP § 2141.

Therefore, the Examiner's assertion that the Kuzumoto reference teaches a second headspace as claimed in the instant invention is clearly wrong and unsupported.

iv) ANDERSON DOES NOT TEACH A SECOND HEADSPACE AS DEFINED IN THE
INSTANT INVENTION

In the Examiner's Answer on page 14, lines 1-11, page 23, line 10 through page 24, line 5, the Examiner submits that the Anderson reference (namely Figure 3) teaches a second headspace as claimed in the instant invention. As shown below, the Examiner is once again clearly mistaken.

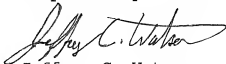
The second headspace is defined in independent claims 1, 7, 8, 14 and 19-22 as "said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween." Accordingly, the second headspace of the instant invention is defined by the second tube sheet and the second end cap. Clearly, the second headspace is not defined by a center tube running through it, as in Figure 3 of Anderson. In addition, having the center tube connect directly with the end cap, as in Figure 3 of Anderson, contradicts the elements in the independent claims of "said second end cap opening being in communication with said center tube via said second head space." Clearly having the center tube connect directly with the end cap, eliminates the end cap opening being in communication with the center tube "via the second head space." All words in a claim must be considered in judging the obviousness of a claim. See MPEP § 2141.

Therefore, the Examiner's assertion that the Anderson reference teaches a second headspace as claimed in the instant invention is clearly wrong and unsupported.

Conclusion

In view of the foregoing, Applicant respectfully request that the Board overturns the Examiners rejections and allows claims 1, 3-8 and 10-22.

Respectfully submitted,



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